

October 3, 1995

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Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

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Re: CC Docket No. 94-102

Dear Sir:

The purpose of this letter is to update the record of the above-referenced proceeding with respect to available technology and affordable costs associated with radio location (E-911 ALI) from wireless services providers.

By way of background, NAVSYS Corporation is a privately-held research and development company specializing in innovative Global Positioning System (GPS) technology. The company was founded in 1986, and has annual revenues of approximately \$2 million.

As you will read in the attached profile, NAVSYS has developed and is deploying an emergency vehicle location system. This system, called LocaterNET, enables motorists to electronically request emergency assistance via cellular phone. With the NAVSYS system, these emergency services requests contain precise GPS-derived location data for the vehicle's cellular phone. This location data is automatically transmitted directly to the responsible Public Safety Answering Point (PSAP).

Designed in cooperation with cellular services providers and emergency services providers, the LocaterNET system is available today. It delivers ALI data to PSAPs for vehicular cellular phones. And NAVSYS was recently awarded an R&D contract by the Department of Defense Advanced Research Projects Agency (ARPA) to miniaturize the existing LocaterNET technology in order to enable generation of ALI information from hand held cellular phones. Miniaturized prototypes should be available in approximately 18 months.


With respect to affordability of available technology, the NAVSYS in-vehicle device currently costs in the range of \$400 per unit, excluding a cellular transceiver. Quantity purchases should drive costs down to the \$150/unit level in 12 months. The miniaturized version of the device is forecasted to cost about one fourth of the price of the current NAVSYS in-vehicle unit, again excluding the cellular transceiver.

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To summarize, NAVSYS Corporation has developed technology enabling cellular phones to generate and transmit precise radio-location data to a PSAP. This technology is available today, and is affordable to a large percentage of the wireless subscriber market as an adjunct cellular service or automobile aftermarket product.

NAVSYS Corporation appreciates the opportunity to participate in discussions on the FCC's Notice of Proposed Rulemaking. Should you have questions about this submission or any other matter, please don't hesitate to contact me.

Sincerely,


Max Cameron
President
LocaterNET Division

Attachment

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Company Background

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NAVSYS Corporation, founded in 1986, is a privately-held research and development company specializing in GPS technology. The company's activities are focused in the following areas.

Innovative Research: NAVSYS conducts basic and applied research in GPS-related areas under contract to government and industrial clients. The company's activities emphasize conceptual research and prototyping under Small Business Innovative Research (SBIR) and similar R&D contracts.

Technology Licensing: NAVSYS develops and patents GPS technology for license by and transfer to companies serving commercial markets.

Special Purpose Equipment: NAVSYS designs and manufactures small quantities of special purpose, high end systems, equipment and software, including GPS signal generators, GPS translator test equipment and GPS surveying and mapping equipment.

GPS Systems Integration: NAVSYS acts as systems integrator on development and deployment of GPS-based systems.

NAVSYS Corporation has 20 employees and annual revenues of approximately \$2 million.

LocaterNET System

NAVSYS Corporation has developed an emergency vehicle location system called LocaterNET. The NAVSYS system employs patented NAVSYS GPS and cellular phone technology in a system enabling motorists to automatically request emergency assistance over wireless communications systems. With the NAVSYS LocaterNET technology, such electronic emergency services requests include precise vehicle location data.

LocaterNET is somewhat unique in that it addresses emergency location of cellular callers as a systemic, not just a technological challenge. In addition to developing technology that can locate cellular transceivers, the project is working toward addressing a host of institutional challenges that must be faced to implement a system that effectively enhances public safety. NAVSYS is working to address institutional issues such as routing of data to the appropriate PSAP, prioritization of calls (7-digit or 911), identifying and addressing false alarms and minimizing both public and private sector liability exposure.

A key systemic challenge is the need for integration of the system into public sector emergency response capabilities. To address this challenge, NAVSYS has involved emergency services providers as key design partners in the system's development. The emergency services community provided critical system design input from an end-user perspective.

The LocaterNET emergency vehicle location system's architecture is based on a client-server model in which motorist equipment and PSAP dispatcher equipment are clients, and a central GPS & database processor is the server.

The system consists of four principal elements.

- * The first is the LocaterNET In-Vehicle Unit (IVU). Produced by NAVSYS, the IVU houses a patented NAVSYS GPS sensor that collects raw GPS data when activated by the motorist. It also includes interface equipment to control the LocaterNET communications system.

The IVU also includes a button box used by the motorist to operate the system and request assistance. About the size of a garage door opener in its automobile aftermarket configuration, the button box is clipped to a driver's side sun visor. The button box serves as user interface for the motorist.

- * The LocaterNET Communications System is a two-way cellular communications link that transmits raw GPS information and assistance requests from the IVU to the LocaterNET Processing System.

- * The LocaterNET Processing System receives emergency assistance requests from IVU clients. Requests, which contain raw GPS data and vehicle identification information, are processed by the Processing System to calculate the vehicle's location and type of assistance required. This data is then passed electronically to the responsible Public Safety Answering Point (PSAP) dispatcher.

- * At the PSAP facility, LocaterNET calls are displayed on a LocaterNET Dispatcher Workstation. Call data displayed on these "clients" includes a precise vehicle location fix superimposed on a digital map as well as information about the vehicle and motorist requesting assistance.

So how does the system work? At the time of enrollment, the LocaterNET IVU equipment is installed in the motorist's vehicle. This equipment includes the NAVSYS GPS sensor, a small GPS antenna, the user activation button box, and cellular communications equipment. Alternatively, LocaterNET components can be installed in a vehicle with an existing cellular phone.

Also at the time of enrollment, each user's personal and vehicle information are entered into a LocaterNET Processing System database. This user data includes name, address, cellular telephone number, vehicle description, vehicle identification, in-vehicle equipment and any pertinent medical information or special needs the motorist might have.

To initiate a request for assistance, the user presses the appropriate button on the button box. These buttons are labeled "Police," "Medical," "Assist," and "Cancel." In response, the in-vehicle unit immediately activates the GPS sensor to capture raw GPS data. At the same time, the IVU compiles an emergency request message.

The cellular phone then transmits this message to the LocaterNET Processing System. Following data transmission the cellular circuit is forwarded directly to the appropriate PSAP dispatcher to enable voice verification of the emergency, collection of additional information and communication of the emergency response vehicle's estimated time of arrival.

The LocaterNET Processing System receives the request message from the IVU and calculates vehicle location from GPS data. Once location has been calculated by the server and combined with vehicle ID information from the server database, the data is electronically routed to the appropriate PSAP dispatcher. Motorist location and subscriber information are superimposed on a digital map.

From a performance perspective, the LocaterNET system's goal is to complete the entire transaction -- from button box activation in the vehicle to display of location/vehicle ID data on the PSAP dispatcher workstation -- in under one minute. The majority of this time is of course expended in establishing a cellular phone connection between the IVU and the Processing System.

What makes the LocaterNET system different?

First, LocaterNET has been designed with both public and commercial input. NAVSYS, the emergency services providers, cellular providers and other technology providers have cooperated to design a system that will enable a PSAP to pinpoint the location of a vehicular cellular phone calling with an emergency request.

Second, this system will deliver cellular phone location as data graphically presented to the PSAP dispatcher superimposed on a digital map. Unlike other systems currently under development, the NAVSYS architecture does not employ a private sector call-handling center that verbally notifies a PSAP of an emergency request. Data is routed directly from the vehicle in distress to the PSAP.

And with the NAVSYS architecture, instead of processing GPS data at the vehicle, the in-vehicle device simply converts the GPS satellite signals into a digital data stream. When the device is activated, the NAVSYS sensor captures a short "snapshot" of GPS data in a digital data buffer, and transmits this raw data back to the Processing System for data manipulation.

This client-server approach -- centralizing computer processing in a single server -- reduces in-vehicle costs significantly.

Also, conventional GPS receivers require a minimum of four satellites to be in view to generate a precise fix. Studies have shown four satellites are not in view more than twelve percent of the time in a typical suburban environment, and that there is significantly less satellite availability in an urban environment. The NAVSYS LocaterNET technology includes algorithms and other processes enabling the Processing System to calculate vehicle location with as few as two satellites in view, making the system much more reliable in an emergency services environment.

And finally, the NAVSYS LocaterNET Processing System utilizes several proprietary algorithms which significantly enhance location accuracy. These algorithms also provide important information to the dispatcher as to the quality of the location solution.

System Accuracy

An independent evaluator tested the NAVSYS LocaterNET system during its early development stages. Test results showed the system delivered accurate vehicle locations to an emergency services dispatcher workstation when the vehicle was in good cellular coverage areas. In these cases, LocaterNET testing showed the mean difference between map and LocaterNET system data was 70 meters, with a standard deviation of 48 meters.

System enhancements introduced during later development stages have improved accuracy significantly.

Cost

The NAVSYS In-Vehicle Unit (IVU) currently costs \$400 in small quantities. NAVSYS' predicted manufacturing efficiencies and other factors associated with full-scale commercialization will reduce this retail price to approximately \$150 per vehicle within 12 months.

System Status

The system is available for deployment.

Work is continuing on system enhancements. Also, NAVSYS efforts to address public sector-private sector institutional issues continue. Coordination among law enforcement, emergency medical services, towing companies and the other private sector services firms continues.

Liability Issues

Keeping in mind NAVSYS' LocaterNET goal of addressing wireless location as a systemic, not just a technological challenge, a key system objective involves analysis and work to reduce public and private sector liability risk. A study has been commissioned and undertaken for an in-depth legal analysis examining the ramifications -- for technology providers, PSAPs, emergency services providers and others -- of implementing the LocaterNET system.

The LocaterNET system design and operational procedures are being developed with this legal analysis in mind.